

What is claimed is:

1. A method of fabricating a fuel activation assembly for use in a fuel cell, the fuel cell comprising a first cell compartment for containing a first fuel component and a second cell compartment for containing a second fuel component, wherein the fuel activation assembly is disposed between the first cell compartment and the second cell compartment so as to activate the first fuel component for producing protons in the first cell compartment and for channeling the protons to the second cell compartment, said method comprising the steps of:

10 providing a substrate having a plurality of apertures; and
securely attaching a plurality of membrane electrode assembly segments to the substrate over the apertures, wherein each membrane electrode assembly segment has a first side and an opposing second side, the second side adjacent to the second cell compartment, the first side adjacent to the first cell compartment for activating the first
15 fuel component in order to produce the protons and for channeling at least part of the protons from the first cell compartment to the second cell compartment via the apertures through the membrane electrode assembly segments.

2. The method of claim 1, wherein said attaching is achieved by a heat bonding
20 process, creating a barrier separating the first side from the second side of each membrane electrode segment, thereby preventing the first fuel component from entering the second cell compartment and the second fuel component from entering the first cell compartment.

3. The method of claim 1, wherein said attaching is achieved by applying an adhesive
25 layer between the substrate and the membrane electrode assembly segments, creating a barrier separating the first side from the second side of each membrane electrode segment, thereby preventing the first fuel component from entering the second cell compartment and the second fuel component from entering the first cell compartment.

30 4. The method of claim 3, wherein the first fuel component comprises substantially a mixture of water and alcohol, and the adhesive layer is resistant to water and alcohol.

5. A fuel cell comprising:

a first cell compartment for containing a first fuel component;
a second cell compartment for containing a second fuel component; and
a fuel activation assembly disposed between the first cell compartment and the
second cell compartment, the fuel activation assembly comprising:

5 a substrate having a plurality of apertures; and
 a plurality of membrane electrode assembly segments securely attached to
the substrate over the apertures, wherein each membrane electrode assembly
segment has a first side and an opposing second side, the second side adjacent the
second cell compartment, the first side adjacent the first cell compartment for
10 activating the first fuel component to produce protons in an activation process and
for channeling at least part of the protons from the first cell compartment to the
second cell compartment via the apertures through the membrane electrode
assembly segments.

15 6. The fuel cell of claim 5, wherein the activation process produces an electrical
current, said fuel cell further comprising

 a first electrically conducting terminal operatively connected to the first cell
compartment; and

 a second electrically conducting terminal operatively connected to the second cell
20 compartment, so as to allow a current load to connect to the first and second electrically
conducting terminals to use the electrical current.

7. The fuel cell of claim 5, wherein the first fuel component comprises substantially a
mixture of water and alcohol, and the substrate is resistant to water and alcohol.

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8. The fuel cell of claim 7, wherein the alcohol comprises substantially methanol.

9. The fuel cell of claim 7, wherein the second fuel component comprises
substantially air.

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10. The fuel cell of claim 5, wherein each membrane electrode assembly segment
comprises a proton exchange membrane disposed between two electrode layers.

11. The fuel cell of claim 10, wherein each membrane electrode assembly segment further comprises two diffusion layers, each covering one of the electrode layers.

12. A membrane electrode assembly for use in a fuel cell, the fuel cell comprising:

5 a first cell compartment containing a first fuel component; and

a second cell compartment containing a second fuel component, said membrane electrode assembly comprising:

a substrate having a plurality of apertures; and

10 a plurality of fuel activation segments securely attached to the substrate over the apertures, wherein each fuel activation segment has a first side and an opposing second side, the second side adjacent the second cell compartment, the first side adjacent the first cell compartment, for activating the first fuel component in order to produce protons in an activation process, and for channeling at least part of the protons from the first cell compartment to the second cell compartment via the apertures through the membrane electrode assembly segments.

13. The membrane electrode assembly of claim 12, wherein each fuel activation segment comprises:

a first electrode layer on the first side;

20 a second electrode layer on the second side; and

a proton exchange membrane disposed between the first and second electrode layers.

14. The membrane electrode assembly of claim 13, wherein the first electrode layer and the second electrode layer of each fuel activation segment are operatively connected to the first electrode layer and the second electrode layer, respectively, of other fuel active segments such that the fuel activation segments are electrically connected in parallel.

15. The membrane electrode assembly of claim 13, wherein at least some of the fuel activation segments are electrically connected in series, such that the first electrode layer and the second electrode layer of each of said at least some of the fuel activation segments are operatively connected to different ones of the first and second electrode layers of different fuel activation segments.

16. The membrane electrode assembly of claim 13, wherein the fuel activation segments are electrically connected in a combination of a series connection and a parallel connection.

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17. A portable electronic device comprising:
an electronic unit for processing signals or data; and
a fuel cell for providing electricity to the electronic unit, the fuel cell comprising:
a first cell compartment containing a first fuel component;
10 a second cell compartment containing a second fuel component; and
a fuel activation assembly disposed between the first cell compartment and the second cell compartment, the fuel activation assembly comprising:
a substrate having a plurality of apertures; and
a plurality of membrane electrode assembly segments securely
15 attached to the substrate over the apertures, wherein each membrane electrode assembly segment has a first side and an opposing second side, the second side adjacent the second cell compartment, the first side adjacent the first cell compartment, for activating the first fuel component in order to produce protons in an activation process and for channeling at
20 least part of the protons from the first cell compartment to the second cell compartment via the apertures through the membrane electrode assembly segments.

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18. The portable electronic device of claim 17, comprising a notebook computer.

19. The portable electronic device of claim 17, comprising a laptop computer.

20. The portable electronic device of claim 17, comprising a tablet computer.

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21. The portable electronic device of claim 17, comprising a personal digital assistant device.